Union of Concerned Scientists

FACT SHEET

THE U.S. NUCLEAR WEAPONS COMPLEX

Savannah River Site

TODAY'S COMPLEX

The U.S. nuclear weapons complex—the laboratories and facilities that research, design, produce, maintain, and dismantle such weapons—must ensure that the arsenal is reliable, safe from accidents, secure from unauthorized use, and no larger than needed to maintain national security. To fulfill those goals, the complex needs resources and facilities to extend the life of nuclear warheads, assess their reliability and safety, understand how aging and modifications affect weapons, and retain employees with essential expertise. It also requires the capacity to dismantle retired weapons in a timely fashion, and methods for verifying further reductions in nuclear weapons. Additionally, the complex must minimize security risks of storing, transporting, and disposing of weapons-usable materials.

The administration and Congress will make important decisions over the next few years on how the complex can use limited resources to best meet these challenges. Doing so requires smart choices based on strict attention to priorities.

The Savannah River Site (SRS) is located in South Carolina, near the Georgia border. For most of its history, it produced radioactive materials for the U.S. nuclear weapons program. From 1953 to 1988, five reactors at the site produced plutonium-239 and tritium (a radioactive form of hydrogen). During this period, the SRS produced 36 metric tons of plutonium-239, about 35 percent of the plutonium produced by the Department of Energy (DOE) for use in nuclear weapons.

The SRS sits on 310 square miles of land and has about 12,000 employees. It is owned by the DOE and given the amount of cleanup required—37 million gallons of radioactive liquid waste are stored in 49 underground tanks, leading to its declaration as a Superfund site—the DOE Office of Environmental Management is the "site landlord." The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the DOE, operates the SRS tritium facilities. Savannah River Nuclear Solutions, LLC, a partnership including Fluor Daniel, Northrup Grumman, and Honeywell, manages and operates the SRS for the NNSA.

The Savannah River Site Today

With reductions in the U.S. nuclear arsenal after the end of the cold war, the SRS's mission shifted to maintaining the current arsenal, disposing of excess nuclear materials, and cleanup of the site. Today the SRS is a key site in the

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Stockpile Stewardship Program (a program for maintaining the safety, security, and reliability of U.S. nuclear weapons without nuclear explosive testing). It is also the primary disposition site for most surplus weapons-grade plutonium and some surplus highly enriched uranium (HEU).[1]

TRITIUM PRODUCTION

The SRS's role in the Stockpile Stewardship Program focuses on tritium and related weapons components. Tritium gas, used with deuterium gas (a nonradioactive isotope of hydrogen) to boost the yield of the primary stage of U.S. nuclear weapons, decays over time and must be periodically replenished to maintain the weapons' effectiveness. The SRS stopped producing tritium in 1988. To meet current needs, it now recycles tritium from dismantled warheads and extracts tritium produced in the Tennessee Valley Authority's (TVA's) Watts Barr reactor in Tennessee.

The SRS periodically replenishes the tritium reservoirs in existing nuclear weapons as part of the Limited Life Component Exchange program. The Department of Defense (DOD) sends tritium reservoirs at the end of their useful life to the SRS to be emptied and refilled with a precise mixture of tritium and deuterium gases, then sent back to the DOD for replacement in weapons.

As part of stockpile surveillance, the SRS also performs reliability testing on the gas transfer systems that inject the tritium-deuterium gas from the reservoir into the plutonium pit as the fission reaction begins.

PLUTONIUM AND HEU DISPOSAL

Two new facilities at the SRS are under construction to support the disposal of surplus plutonium: the Mixed Oxide Fuel Fabrication Facility (MFFF), and the Waste Solidification Building, with the latter nearly complete. A third, the Pit Disassembly and Conversion Facility, has been canceled due to budget constraints and the availability of alternatives.

Plans call for most surplus plutonium at the SRS to be converted to plutonium oxide and used to fabricate mixed oxide (MOX) fuel for use in commercial nuclear reactors. Plutonium too impure for use in MOX fuel will be sent to either the Waste Isolation Pilot Plant in New Mexico or the existing Defense Waste Processing Facility at the SRS, where it will be "vitrified"—converted to a glass form suitable for permanent disposal.

In its FY 2014 budget request, the NNSA decided to slow the MFFF project while the contractor reviews the program and provides updated cost and schedule estimates, and the administration conducts an assessment of alternative strategies for disposing of the excess plutonium. (See below for details.)

> ***The Savannah River Site's role in the Stockpile Stewardship Program focuses on tritium and related weapons components.***

The HEU disposed of at the SRS comes from spent fuel from domestic and foreign research reactors, as well as excess HEU-bearing materials from other DOE sites. The spent fuel is dissolved in acid to separate the HEU, which is blended with natural uranium to create a low-enriched uranium solution that is sent to a commercial facility to be turned into fuel for use in TVA power reactors.

OTHER MISSIONS

The SRS is involved in environmental stewardship, environmental cleanup, and research on renewable and other low-carbon energy sources. It also houses the Savannah River National Laboratory, which works on national and homeland security, energy security, and environmental and chemical process technology.

Budget

The SRS's FY 2013 budget is approximately $1.6 billion, with $1.3 billion of that going to defense environmental cleanup to decontaminate areas of the site that were associated with nuclear weapons production.

For FY 2014, the SRS has requested a total of $1.4 billion in funding, $1.2 billion of which is for defense environmental cleanup. As noted above, the MOX project has been slowed for FY 2014 and its funding reduced, falling from $438 million in FY 2013 to $320 million in FY 2014, a reduction of 27 percent.

Current Issues

MIXED OXIDE FUEL FABRICATION FACILITY (MFFF)

Construction of an MFFF at the SRS began in 2007. This facility would blend plutonium dioxide made from surplus weapons

1 HEU contains greater than 20 percent uranium-235 (U-235) or U-233; low-enriched uranium contains less than 20 percent. In contrast, natural uranium contains less than 1 percent U-235. HEU comprising more than 90 percent U-235 is considered weapons-grade uranium, although all HEU can be used to make nuclear weapons. Weapons-grade plutonium is largely plutonium-239 (Pu-239) and contains less than 7 percent Pu-240.

plutonium with depleted uranium dioxide (from the uranium enrichment process) to produce MOX fuel to be used in commercial nuclear reactors.

The NNSA's decision to slow the MFFF project was based on continually increasing cost estimates and delays. The project is now 14 years behind schedule, and its estimated operational date has continued to slip, from 2016 to 2019, according to the most recent NNSA analysis. Costs have also risen from the original 2002 estimates of less than $1 billion for design and construction and $156 million per year for operations to $7.7 billion and more than $500 million per year, respectively.

Congress, however, has questioned the wisdom of slowing the MOX project after a large investment, and expressed concern that this may ultimately only lead to longer delays and further cost increases. An appropriations bill for FY 2014 is still in the works, but may require that the NNSA continue construction as previously planned or disallow further study of alternative strategies. The future of the project will depend on the outcome of congressional action, and possibly also contractor and administration reviews.

Another source of concern about the project is that no U.S. commercial reactors have yet agreed to use MOX fuel once it is produced. U.S. reactors are not designed to use MOX fuel; to make the switch, they need to conduct tests to ensure that it would perform in the same way as standard uranium fuel. Duke Energy, the one company that has undertaken such a test, cut it short due to safety concerns, and abandoned further plans to use MOX fuel. The TVA and Energy Northwest, a publicly owned company in Washington State, are currently exploring the possibility of using MOX fuel, but testing could take until 2025.

Using MOX fuel in commercial reactors also raises safety and security issues because it contains plutonium and other elements not present in standard uranium fuel. MOX fuel entails the risk of a greater release of radiation in case of an accident. Manufacturing the fuel involves handling large amounts of plutonium, making it vulnerable to theft. One way to avoid these risks is to immobilize surplus plutonium by mixing it with radioactive waste and converting it to glass or ceramic form, which would then be sent to a geologic repository for permanent disposal.

PLUTONIUM AND NUCLEAR WASTE STORAGE

The SRS currently stores plutonium from DOE sites that have closed down. Most of this plutonium was intended to be stored temporarily while the MFFF was being built, and delays in building the MFFF mean that the plutonium must be stored longer than planned. There are concerns that if the MOX fuel program is canceled, this plutonium may be left in storage at SRS indefinitely.

Additionally, as noted above, some plutonium shipped to the SRS is too impure to use in MOX fuel. DOE planned to vitrify this waste and ship it to a permanent repository. Now that the Obama administration has abandoned plans to build a repository at Yucca Mountain in Nevada, state and local officials in South Carolina have expressed concern that the lack of another viable site could lead to the indefinite storage of plutonium at SRS. They have sued the federal government to try to prevent the termination of the Yucca Mountain project; this litigation is ongoing. In the meantime, cleanup of existing onsite waste is proceeding slowly, and is over budget and behind schedule.

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NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

WASHINGTON, DC, OFFICE
1825 K St. NW, Suite 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162

WEST COAST OFFICE
2397 Shattuck Ave., Suite 203
Berkeley, CA 94704-1567
Phone: (510) 843-1872
Fax: (510) 843-3785

MIDWEST OFFICE
One N. LaSalle St., Suite 1904
Chicago, IL 60602-4064
Phone: (312) 578-1750
Fax: (312) 578-1751

WEB: WWW.UCSUSA.ORG